Lorentz model of light-atom interaction

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Solution: *a. The differential equation is,*

$$m\ddot{x} + m\omega_0^2 x = -e\mathcal{E}\sin\omega t \ .$$

b. Entering the solution into the differential equation makes it easy to verify that the solution satisfies the differential equation.
c. Entering the initial conditions,

$$x(0) = A = 0 \qquad , \qquad \dot{x}(0) = \frac{-e\omega\mathcal{E}}{m(\omega_0^2 - \omega^2)} + B\omega_0 = 0 \ .$$

Hence,

$$x(t) = \frac{e\mathcal{E}}{m(\omega_0^2 - \omega^2)}\left(\tfrac{\omega}{\omega_0}\sin\omega_0 t - \sin\omega t\right) \ .$$